G. R. S. IX-5]

*Previous references.*

File No. 4 8/1871

Serial Nos. 1–3

191 .

(Agriculture)

*Later references.*

# GENERAL AND REVENUE SECRETARIAT.

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*Serial Nos.*

Part B for January 1872.

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SUBJECT.

Report on the Condition of Sericulture in Mysore.

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Indexed

W D 88—GPB—50,000—24-7-16

1871 No 2497

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940

From

To The Secretary to the Govt of India in the dept of Rev: Agriculture & Commerce Simla.

Dated 21st August

Despatched 24th "

Received

Enclosures No. 7

Section Agri

File No 4 - 71

Serial No 1

General No 2497 1871-72.

No. 9

Rec'd 1871

In reply to demi official letter of 22nd June last I submit for the information of Govt such particulars in connection with silk cultivation in this Province as are available under the several heads therein noted.

General No. 2497

9

Mysore Chief Commr's Office
Bangalore 21st August 1871.

To
The Secy to Govt.
Dept of Agriculture &c

Sir

In reply to your Memo of the letter of the 22nd instant, I have the honor to submit for the information of Govt, such particulars in connection with the cultivation of the Mysore, as are available, under the reference heads given in your letter. These particulars are it is feared, very meagre but owing partly to the inattention which in the past years has been paid to the collection of statistics on this subject, and partly to the loss or destruction of some of the old records bearing reference to it, the information which it has been practicable to obtain is not sufficiently full to supply a basis of the industry or to explain fully the ~~[illegible]~~ changes that in the course of years, the Mussulmans decline of development in Mysore, the industry should have declined, so rapidly as to the Natives into speedy extinction -

1. Since when silk culture has been pursued & the particulars of climate - It is believed that the cultivation was first introduced at the time of the Mahomedan dynasty, ~~[illegible]~~ in the receipt of a large & needy community of Mussulmans who had settled in the neighbourhood of Seringapatam. The industry is still chiefly confined to that Capl, and languishes so generally in consequence of the religious objections of

the taking of
a large class of Bombay [illegible] life
is murdered in the destruction of the
Chrysalis — The locality in which
the occupation of rearing silk worms on
Silk Reelig is chiefly carried on, extends
in the Bangalore District, and to a
limited extent only in the Kolar, Mysore
& Tumkur Districts adjoining. From
what we can learn the area of this
industry has not extended [illegible] the Province, &
the [illegible] accounts for the [illegible]
near Bangalore. Perhaps Mysore alone
supplies the [illegible] Market [illegible], the demand for which has
The climate of Bangalore and of the
Silkproducing tract [illegible]
is very equable, there being
no extremes of heat or cold such
as are experienced in the North of
India. The average maximum &
minimum readings of the Thermometer
for the whole Province are given in the
margin. The mean monthly temperature
of places here as well as in Southern India generally
has been stated in good authority to vary
about 10° or 15°. December & January 5°
or 6° below, and April & May 6° or 7° above,
the mean annual temperature which [illegible]
for the altitude of Bangalore (3000 feet)
is 73°, and for that of Shimoga (1909 feet)
76°. The climate of the Mysore generally
is dry.

× Maximum. 95°
Minimum. 53.

2. Extent of land under cultivation in Mulberry:

From the records of this Office it appears
that in 1841/42, the extent of land under
Mulberry cultivation for Silkproducing

District was Acres 2309. In 1851/52, Acres 7243. In 1861/62, Acres 11497 - In 1866/67, the Year of the most Disastrous famine experienced in the Province, the cultivated had reached its highest point — viz Acres 12809, and has since declined to Acres 11684. The Agriculture is however nominal & a great deal, for a large portion of land held as Mulberry garden, is cultivated with Rice Crops, and as much more is believed to lay waste. The Ryots have no longer to Sericulture the description of Encouragement, which they received formerly at the hands of the Collector, as will be specially stated. The Variety

4. Quantity of Silk produced.

There are no regular means of collecting Reliable Statistics of the Trade, but from the Returns furnished by the Village Accountants, the quantity of Silk produced is stated as 2595 Maunds. The largest quantity for any one Year was 14622 Maunds in 1859/60 - ad valorem Duty on Silk was abolished -

5. Quality and price of Silk

As to the quality of the Silk produced & the native method of Filature, the following extracts from a Letter from Captain Leonard, by Signor de Vecchy, an Italian Gentleman who made Experiments a few years ago to improve the Industry, and for that purpose established a Reeling factory at Kangeri near Bangalore, was "The Silk reeled by the natives is the worst I have ever seen. It is of a bad colour, the thread is irregular, Flat, Knotted & dirty. The best samples are worth on the Spot from 4 to

† Rates vary from Rs 2.10.4 to Rs 29.4.1 per Seer

* Mr. Saunders 1386 - 24 Duffer (obtained from Duffer)

Appendix A to Letter of Captain Cameron of 20 June 1865

5 lbs a seer - In Europe, the same would fetch 13 or 14 Shillings when Japanese silk sells for 37 or 38 Shillings per lb. The silk reeled here is used for the native manufactures of Trichenopoly, Secundrabad & Bombay" - Cocoons also accompanied the letter marginally noted showing the [illegible] Insect as specific by Broken & Copland as well as in this Country, & various Samples of silk produce from the [illegible] worm, but reeled at a factory which was established near Bangalore in 1843, for the purpose of introducing improved methods in the rearing of the [illegible] worms, and in the reeling of the Mulberry.

b. Kinds of Silk worms Kept with the Eccalypte leaves. Up to the year 1866, when fresh breeds was imported, the only kind of silk worm reared in this Country was the 'Bombyx Sinensis' of four moults & yellow, indigenous to China. Three crops yield in the course of a year from 5 to 6 cocoons which are described as being inferior in size to those of China & Japan, and as having a tendency to taper at the ends. The silk of these cocoons is not closely woven, and is internally flossy, to keep the quality of the thread when [illegible] by European processes is found to good. The Bombyx Mori and specimens of the Milanese & Cashmere breeds were introduced by Hon Gov. Sir Mark Mr. de Vecchi but from causes not explained, they have ceased & succession of Trials, does not.

Method of rearing the worms. No account has been furnished [illegible] of the native method of rearing silk worms - but [illegible]

[illegible] of Mysore seem is 1/10 the cost of the [illegible] obtained from [illegible]

Appendix B

1/ From Asst Surgeon Smith to Capt Campbell 23rd & 27 10 Aug/47 the Secretary

2/ From the Resident Govt of Mysore No 26 of 1847 - to Secretary from Bangalore dtd 29 Oct/47

4/
10.

his attention of the Lt Governor has been drawn to an excellent description of the method given by his Assistant Collector of Tuticorin in the Madras Presidency & published in the Pro. of the Madras Govt No 1334 dated 20 May 1870. The practice there described is substantially the same that observed by the Cheroos in this province.

8 Method of reeling the Silk adopted

The method of reeling practised by the Natives is there described by Mr H.E. Sullivan Asst Collector of Coimbatore & in a report addressed to the Madras Bd of Revenue x

Appendix C.
Bd of Revenue Proceedy, No 1965 of 11 May 1871.

Mr Sullivan's Filature near Sangalore - (Here insert Para 5 of Mr Sullivan's letter of 11 Nov 1870 and also insert the Sketch of Native Silk reel at the 5th para)

9 Introduction of European Silk Spinning

European Silk Spinning has been tried in this province by the Mysore Government between 1865 and 1870 & consisted of 11 Reels worked by Europeans at Kengeri near Bangalore. The Filature was established at Kengeri by the Mysore Government, and has a ready market close to the Cheroos for the sale of their produce. The finest species of Cocoons, as well as Japanese & other Varieties of the Mulberry plant were introduced by the Govt of Mysore under the auspices of the Royal Govt and Statistics of the people - The Supt de Vecey also took up a considerable tract of land free of assessment for 7 years, for the purpose of cultivating Mulberry in connection with his factory. There, however, as also in Salem & Madura Districts where they have been tried & Govt have been repeated & Govt in the Collectors marginally note - I am directed to

Appendix D
To Govt of India Agric Dep No 1901/96 of 16 Aug 1869.

forwarded a copy of that letter, & its enclosure herewith, for reference in your Dept, and I shall also apply for ~~a copy of~~ the communication addressed by the Madras Board of Revenue detailing the result of their recent ~~measures~~ attempts to introduce the Lapanese plan of silk worm.

(Included in Appendix D)

* To Secy to Board of Rev Madras
No 1509/385 of 24 June
To do do
No 2443/575 of 17 Aug

6. Full particulars of experiments made & reports on the cultivation. All the information which can be afforded on this subject is contained in the letters & papers in the preceding list.

11 Opinions of practical persons as to defects of existing system. On this point, I can refer you to the opinions expressed by Capt de Vecchi in his letter dated 5 Nov, which must be accepted as representing the facts & the conditions of the industry at that time, as well as the more prominent defects. Both M. de Vecchi and Mr de Vecchi (who succeeded to the charge of the Nursery Station) have now left the country, discouraged by the failure which has followed all their laudable & persevering efforts & the liberal aid of the Mysore State, has frequently attended the measures which have been adopted. The chief cause of the deficiency from obtaining cocoons in more than one, the view of these gentlemen as to the causes of the failure that has occurred in the acclimatization of the Japan & especially the Lapanese species of silk worm. Of these & other matters connected with the Economic Resources of Mysore,

which the cultivation was brought direct from Japan, without any preparation to do to make a change, and he is of opinion that no additional trouble arises from cultivating the Japanese plant than of the native species of tea. On the other hand, the tea plant which has successfully established itself, has been cultivated in the Himalaya for very many years, and thereby deteriorated by close breeding. It is probable that the climate of the Peninsula and Central Asia which is now subject, a which tracts stretching northwards may be reached by railway from the south of China, the climate of which approaches more nearly than — to that of the plateau.

12. I am directed to express to Colonel Meadows regret that the information which is possessed in the Office, is not as full and exhaustive on the several points touched upon, as would be desirable. As previously remarked however, the subject has not been made the close attention & study from any person now in the Himalaya which would admit of a more complete and satisfactory opinion being obtained, as of the Irish superintendent in the last place of the Office under whose charge the Plants were

Sir

1871.

Department of Agriculture, Revenue, and Commerce.

[ Fibres and Silk. ]

CIRCULAR RESOLUTION.

Nos. 69

Dated 30 August 1871.

SILK trade in India—Improvement of sericulture.

No. 69

*Extract from the Proceedings of the Government of India in the Department of Agriculture, Revenue, and Commerce,—dated Simla, the 27 August* 1871.

[ FIBRES AND SILK. ]

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READ again the following papers:

Demi-official letters to Local Governments and Administrations, dated 23rd June and 5th August 1871.

From Government of the Punjab, No. 1213, dated 8th July 1871.

To „ „ No. 47, dated 3rd August 1871.

Despatch to Secretary of State, No. 1, dated 3rd August 1871.

Demi-official letter to Honorary Secretary, Silk Supply Association, dated 24th August 1871.

From Government of Bengal, No. 2996, dated 10th August 1871.

From „ „ No. 2512, dated 22nd August 1871.

From Government of Bombay, No. 2998, dated 22nd August 1871.

From Chief Commissioner of Oudh, No. 3933, dated 23rd August 1871.

Read also a paper by Captain T. Hutton, Corresponding Member of the Agricultural and Horticultural Society of Bengal, containing notes on the Indian Bombycidæ, dated 26th July 1871.

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## OBSERVATIONS.

THE Government of India has been recently endeavouring to acquire full information as to the present state and prospects and past history of the Indian silk trade, in view to ascertaining the best practical methods of developing it, and improving sericulture generally in India.

2. Amongst other papers received from various sources, Captain Hutton has forwarded a paper on the Indian and Asiatic species of the Bombycidæ, to which it seems desirable to give early publicity.

3. Much, it is believed, may be done towards both increasing and improving the silk produce of India; but one of the first essentials to any successful action in these directions is complete information as to all that has yet been done, or attempted in India in this matter. A good deal of useful information has been gleaned from the records of the Government of India, and some few papers have been received from Local Governments and private individuals; but much more is, it is believed, available, which His Excellency the Governor General in Council is anxious to obtain, and in the collection of which he would invite the co-operation of the public generally and all Government officers.

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ORDER.—Ordered, that this Resolution and Captain Hutton's Notes on the Indian Bombycidæ, be published in the Supplement to the *Gazette of India*, and that the several Local Governments and Administrations, the public generally, and all Government officials be invited to furnish the Government of India in the Department of Agriculture, Revenue, and Commerce, with any information (whether in print or in original manuscript) of which they may be in possession, in regard to sericulture in India, and the Indian silk trade, past and present.

Ordered also, that the thanks of the Government of India be conveyed to Captain Hutton for his monographic sketch of the Indian Bombycidæ.

*Ordered also, that a copy of this Resolution and of Captain Hutton's Notes* on the Indian Bombycidæ be forwarded to the Local Governments and Administrations noted in the margin, to the Chambers of Commerce, Madras, Bombay, and Bengal,—to the Agricultural and Horticultural Societies of Madras, Bombay, Bengal, the Punjab, and Oudh, and to Captain Hutton.

Government of Madras.
" " Bombay.
" " Bengal.
" " N. W. Provinces.
" " Punjab.
Chief Commissioner of Oudh.
" " Central Provinces.
" " British Burmah.
" " Mysore and Coorg.
Resident at Hyderabad.

(True Extract,)

*Secretary to the Govt. of India.*

*Notes on the Indian Bombycidæ, as at present known to us, by Captain* THOMAS HUTTON, F. G. S., C. M. Z. I., *Corresponding Member of the Agricultural and Horticultural Society of India,—dated Mussoorie, the 26th July* 1871.

*Notes on the Indian Bombycidæ, as at present known to us, by Captain* THOMAS HUTTON, F. G. S., C. M. Z. I., *Corresponding Member of the Agricultural and Horticultural Society of India,—dated Mussoorie, the 26th July* 1871.

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## BOMBYCIDÆ.

1. *Bombyx mori.*—(Lin.)—The largest of the domesticated Chinese Bombyces, originally from China, about North Latitude 32° to 34°. Also in Japan. This has been cultivated in Europe, especially in France and Italy, as well as in Syria, Egypt, Persia, Bokhara, Afghanistan, Cashmere, in one or two localities of the Northern Punjab near the hills, and thrives well at Mussoorie, everywhere feeding upon various species of mulberry and everywhere an annual, only *except* at Mussoorie, where I can obtain two crops. This is the worm that lately failed in France after centuries of domestication. It occurs *nowhere in the lowland Gangetic Provinces*, but its name is assigned, in ignorance, to *all* the under-mentioned species. "Where ignorance is bliss, 'tis folly to be wise," and after all, "what's in a name? a rose by any other name would smell as sweet!"

   This species has been introduced into Australia where it is said to thrive well, although Dr. Wallace of Colchester has lately informed me that Australian eggs do not hatch so kindly and regularly in England as English bred eggs; instead of coming forth in a swarm, they appear daily in small quantities only. This I attribute to the high temperature of Australia having acted injuriously upon the constitution, which is debilitated.

   The best silk of all is produced by this species, and readily sells, with good reeling, at 25 shillings per lb. Mr. Cope sold some at that rate which he produced in the Punjab; and that reared at Mussoorie fetched the same price. A splendid silk is produced by crossing this species upon the smaller monthly worm known in Bengal as the *désee*, but the crossing requires great attention, and the out-turn after all may not be worth the trouble, for unless very closely watched and attended to, the worms will invariably revert to annuals. Silk—golden yellow when in health.

2. *Bombyx textor.*—Hutton.—This species is cultivated sparingly in several parts of India, but its constitution is thoroughly worn-out, and it ought to be sent to a hill climate. At Mussoorie it thrives well, and although like the last, an annual everywhere else, here it yields a second or autumnal crop also. It was originally brought from China, near Nankin, in North Latitude 32°, but is fast fading away from Bengal. It is cultivated in France and Italy and in China, as well as in Bengal, and in those countries generally produces a pure white silk; in Italy there are more white than yellow cocoons, but in France more yellow than white; this is dependent upon climate, as is well shown at Mussoorie where worms introduced from Bengal produce *white* cocoons for the first crop, but almost all yellow in the second crop. The worm being northern, is impatient of heat and suffers accordingly in constitution, the silk in consequence becoming white, which, as I have elsewhere pointed out, is generally a sign of loss of constitution, not only among silk-worms, but among animals still higher in the scale of nature; the natural colour of the worm of *Bombyx mori* is nearly black-brindle, whereas the worms under domestication are of a sickly creamy white. So, then, the climate of France being more temperate than that of Italy, produces more yellow than white cocoons. This species is often termed the Milanese or Italian stock, and in Bengal is known as the Burra pooloo, because its cocoon is larger than those of the so-called *désee* worms or polyvoltines.

   It is cultivated in Assam and, according to Dr. Royle, is there and elsewhere called "*Pat* major," although it is invariably confounded with *B. mori*, than which it is at least an inch smaller, though in other respects closely resembling it. The cocoons are of a different texture with more floss. The silk varies in price from 18 to 22 shillings per lb. Unless it be very soon transferred to the hills, this species will certainly die out; here I *could insure its life* without difficulty.

3. *Bombyx Cræsi.*—Hutton.—This is the largest of the monthly worms, and in Bengal passes under the Native name of the Madrassee or Nistry, and is as usual confounded by Europeans with *B. mori*, although the one passes as an annual, and the other as a monthly worm.

   The silk is good, of a golden yellow, and the worms thrive best in a temperate climate; in Assam (*apud* Royle) it is known as "*Pat* minor." This species is cultivated in several parts of India, and thrives well at Mussoorie. It is to be

particularly remarked, however, that none of the Chinese species, whether annual or monthly, have hitherto succeeded in the North-Western Provinces, Dr. Royle long since remarking that all the Old Company's Filatures did not extend higher up the country than about 26° of North Latitude, owing to the dry hot nature of the North-Western climates.

4. *Bombyx fortunatus.*—Hutton.—Known to the Bengalees as the *désee* worm, and like the others dignified by Europeans with the name of *B. mori.* Silk—golden yellow, distributed over Bengal and other parts of Southern India; but people know so little of the distinguishing characters of species, that it becomes very difficult to say what species is alluded to in magistrates' reports unless the native name is mentioned. This also is one of the polyvoltines. A sure mark of distinction between the worm of this species and that of any of the others exists in the fact that when near maturity, it becomes of a dull leaden blue color. This species thrives best in the cold weather. It is very small, but yields a good cocoon, although the returns of silk are said to be uncertain; there are no dark worms observable among them. The worm is figured in the second part of my paper "On the Reversion and Restoration of the Silkworm," as published in "The Transactions of the Entomological Society of London"—(*quod vide.*)

5. *Bombyx Sinensis.*—Hutton.—This is known as the "*Sina*" of Bengal, but, like the others, it originally came from China; it is very prolific, and even at Mussoorie goes on yielding crop after crop, up to the middle of December. The cocoons vary in colour, some being white and others yellow, while others even have a beautiful faint greenish hue. These changes clearly show that the health of the worm is becoming impaired. There is a peculiarity about these also which may enable the tyro to distinguish them from any of the others; while all the other species hatch slowly during the morning, from six to twelve o'clock, the *Sina* worms come forth all in a batch, or continue hatching all day and all night.

6. *Bombyx Arracanensis.*—Hutton.—This I have only once been able to procure and the worms died off soon after hatching. The cocoon is said to be larger than those of the Bengal monthlies, but very little beyond the fact of its existence appears to be known, and people are so apathetic in these matters that letters, as a rule, remain unanswered. As the species is supposed to have been introduced from Burmah, it may probably turn out to be the same as that which was lately reported to exist in Burmah.

7. *Bombyx* ———? I have heard of a species which in Central India is said to yield three crops of silk in the year, and that as soon as they are hatched, the worms are placed out upon mulberry trees and left there until they spin the cocoon. Some of the cocoons were kindly sent to me, but were so crushed in transit that they were destroyed; the cocoons were small, but silk good, of a pale colour and something like those of *B. fortunatus.* I wrote for more cocoons and eggs, but my application has been unattended to, although my correspondent promised to assist me. I shall try again.

The following, with the exception of *B. Huttoni,* are little known. Mr. F. Moore wishes to place them in a separate genus under the name of "*Theophila,*" one of his chief characters being the rows of spines on the larvæ; I object, however, to the establishment of this genus, because, in truth, we know little or nothing about them, and as to the spines, two species only are as yet known to possess them; nevertheless, they certainly do not stand properly under the genus *Bombyx,* but we must wait yet awhile in order to ascertain whether all can be included in the same genus.

8. *Bombyx* (Theophila) *Huttoni.*—Westwood.—This is a wild mountain species, feeding on the indigenous mulberry of Simla, Mussoorie, and Almorah. I first discovered it at Simla in 1837, and afterwards in great abundance at Mussoorie. In some years they swarm to such an extent, that by the end of May, the worms of the first, or spring brood, have thoroughly denuded even large forest trees, not leaving a single leaf. In this predicament they quit the tree in search of another which they generally find near at hand, and which is then soon thickly covered with cocoons spun in the leaves; but if, unfortunately, they fail to find a tree at hand, the whole brood perishes, the most forward worms spinning cocoons among shrubs and grass. The trees thus denuded instead of dying, are in another month once more in full leaf, as if nothing had happened.

It is a strong and hardy species, yielding a beautiful soft, whitish silk, and although the worm is too intractable and wandering to be treated in the usual manner in the house, yet I am by no means sure that it cannot be turned to good account by collecting the cocoons from the trees, as was evidently done in the outset by the Chinese with respect to *Bombyx mori.* For a full report I refer the reader to my paper Part II., "On the Reversion and Restoration of the Silk-worm," published in the "Transactions of the Entomological Society of London."

9. *Bombyx* (Theophila) *Bengalensis*—Hutton.—If the species discovered some years ago in Bengal by my friend A. Grote, Esq., is correctly figured in my paper No. 2, just alluded to, then that sent to me from Chota Nagpore in 1869, by Mr. King, must be distinct, for it is in all respects as to shape, colouring, markings, &c., a perfect miniature of *B. Huttoni;* that it is distinct, however, is shown in the smaller size both of larva and imago, as well as in its being a polyvoltine instead of a bivoltine like *B. Huttoni.* In Chota Nagpore the food was the leaf of *Artocarpus Lacoocha,* upon which tree likewise Mr. Grote found his specimens; but as the latter gentleman was in the habit of employing an accurate native delineator of insects, I much doubt any error occurring in the figure kindly supplied by him to me, and therefore am inclined to regard Mr. King's species as distinct from Mr. Grote's, and would term the Chota Nagpore insect *Bombyx* (Theophila) *affinis,* (nob.) in reference to the remarkable affinity to *B. Huttoni,* in all its stages.

10. *B. affinis—Hutton.*—When the young worms hatched at Mussoorie, from eggs and cocoons sent from Chota Nagpore, I had no leaves of *Artocarpus* within some miles and was sadly puzzled to feed the worms; I tried, without success, the leaves of wild fig trees, *ficus venosa, morus nigra, morus sinensis, m. multicaulis, m. cucullata, m. serrata* (wild), but all to no purpose, and I had almost made up my mind to lose the species, when it suddenly occurred to me to try the leaves of *m. indica.* With these I succeeded, the young worms riddling the hard coarse leaf into a perfect sieve in a few minutes. Like *B Huttoni,* in the two first stages they were dreadfully troublesome, wandering down from the branches and spreading all over the table, but as they grew larger they became more tractable and remained tolerably quiet, eventually spinning their cocoons in the leaf like *B. Huttoni.*

When the moths appeared, there was equal difficulty in getting them to pair, and then even many of them laid no eggs; those that did so, deposited them in batches and then covered them over thickly with the brush or tuft of hair at the end of the abdomen; thus the eggs of *B. Huttoni* are pale straw colour, glued to the trunk or branches of the tree, and quite naked, whereas those of *B. affinis* are of an orange colour and covered with dark hair. This renders it difficult to detect them on the bark, and the covering is probably used as a non-conductor of heat. The eggs of *B. Huttoni* are scattered along the under side of the small branches or over the bark of the trunk, whereas those of *B. affinis* are placed in patches, or groups, and none of the eggs that remain without a coating of hair ever produce worms. I obtained four broods, the last being reared on the trees of *M. nigra* in the open air. I am sorry to add that none survived the winter, although the cocoons were kept in a room with a fire; thus, after all my trouble, I lost the species. The silk resembles that of *B. Huttoni,* and is equally good, although from the smaller size of the cocoons there is less of it.

Mr. Grote kindly sent me a specimen of his moth which arrived, as usual by post, quite crushed; the specimen, however, as far I can remember, was whitish and very much smaller than that of *B. affinis.*

11. *Bombyx* (Theophila) *subnotatus.*—Walker.—Nothing more is known of this species than is contained in Mr. Walker's description of the moth, and that it was procured from Singapore by Mr. R. A. Wallace; neither the larva nor its food is mentioned.—(*Vide Proc. Linn. Soc. Lond. iii. Zool., p.* 188.—1859.)

Whether this be a true Theophila, we cannot tell.

12. *Bombyx* (Theophila) *Sherwilli.*—Moore.—This is closely allied to *B. Huttoni,* but the larva is unknown; all that has been ascertained is that the specimen was obtained from a collection made by the late Major J. L. Sherwill, but whether captured in the plains or at Darjeeling, no one knows. People who have often collected at Darjeeling assure me they never saw the species there; hence I incline to regard it as a lowlander, feeding on *Artocarpus* perhaps. All that Moore says of it that it is "allied to *B. Huttoni* and differs from it in being somewhat larger, and of a grayer colour, the fore-wing having the apical patch, fuliginous instead of black, and it has only a single transverse discal streak (instead of the two as in *B. Huttoni*). A most prominent character is that the abdomen is tipt with black, as well as having the dark waistband."

13. *Bombyx* (*Ocinara*) *religiosæ.*—Helfer.—Although this stands as a Bombyx, the entire description as given by Dr. Helfer applies rather to a species of *Ocinara.* It is called the Joree silk-worm by Helfer, and the Deo-mooga silk-worm by Mr. Hugon. It is said to occur in Assam and Sylhet; but I have failed to elicit information from those localities. Bombyces are far less erratic than the allied genera of *Theophila* and *Ocinara,* and if indigenous in any district, there they will remain year after year, sometimes in greater, sometimes in lesser, numbers; but *Theophila* and *Ocinara* are both inconstant; plentiful one year, absent altogether the next, and

with the latter sometimes for two or three years. Hence Grote for or four or five years lost sight of *Theophila Bengalensis*, and no one seems to have seen Helfer's *B. religiosæ* since the time of its discovery.

14. *Ocinara Lida.*—Moore.—This species is found at Mussoorie where it feeds upon the leaves of *Ficus venosa*, the larva being very like that of a geometra, and spinning a small white cocoon on the leaf or against a stone beneath the tree. It is too small to be serviceable. I named it after Mr. F. Moore, but he tells me it is the same as the Javanese O. lida. It is a multivoltine. It feeds on the wild fig also.

15. *Ocinara lactea.*—Hutton.—This also occurs at Mussoorie, feeding on *Ficus venosa* and spins a curious little cocoon of a yellow color, within the leaf; over the cocoon is laid a net-work of yellow silk, too small to be of use. It has several broods during the summer. The larva is smooth, whereas that of the preceding is hairy.

16. *Ocinara comma.*—Hutton.—The moth of this is white, with a dark comma-shaped mark on the disc of the upper wings; hence the name. It occurs both in the Doon and at about 5,500 feet of elevation below Mussoorie.

17. *Trilocha varians.*—Moore—Is a small species found in Canara; and again by Mr. Grote in Calcutta. As a silk-yielder, it is of no value.

For further remarks on these species, consult the second part of my paper "On the Reversion and Restoration of the Silkworm."

18. *Cricula trifenestrata.*—This handsome and curious species is found in various parts of India, sometimes in such numbers in the larva state as to become a perfectly destructive pest; it denudes the mango trees of every leaf, destroys the foliage of the cashew-nut, and is even said to attack the tea plants. It occurs in Burmah, Assam, Moulmein, and Chota Nagpore in Central India. The cocoons are formed in clusters, so closely interwoven, that they cannot be separated for reeling, which, indeed, their very texture prohibits; they are therefore carded, but are not much used; the cocoons are very irritating, from a number of minute bristly hairs from the caterpillars. I am inclined to think there are two species now standing under this name: as some cocoons are very much reticulated, while those from other localities are far more closely-woven and scarcely reticulated at all. This will never prove productive as a silk-yielder, unless the cocoons can be reduced to a gummy pulp, and used for some other purposes.

19.—*Antheræa paphia,*—Linn.—This handsome species is distributed all over India from Burmah to Bombay; but it has to be observed that there are in this wide range several distinct species included under the name. To separate these effectually must be the work of time, and until it is done, there can no really good Tusseh silk be produced. That several of these species are capable of producing a very valuable article of commerce is an undoubted fact, and from its cheapness and durability it would be a boon to that class of the British population which cannot afford to indulge in expensive silks. There is a stupid outcry against Tusseh silk now raised at home by some of the would-be-knowing ones, who are quite ignorant of the fact that they are not sitting in judgment upon a genuine article, but upon one compounded by the natives by the mixture of the silks of three, if not four, distinct species whose fibres are of different thickness. Take the silk of any one un-crossed species and reel it as carefully as is done with the produce of the Chinese Bombyces, and these cavilling quidnuncs who do not know one species from another, would soon sing to a different tune.

At present the native method is this: At the season when the cocoons have been formed, the jungles swarm with them, and men sally forth to pluck them from the trees. These jungles, however, contain several distinct species, a thing of which the natives are profoundly ignorant; these cocoons are all promiscuously huddled together, placed in hackeries, and carted off to the dealers. They are then sorted according to size, thickness, colour, &c., and named accordingly as a kind of trade mark, but without any reference to species. The cocoons selected for reeling are treated in the roughest manner and all kinds spun off together; those that are kept for breeding are allowed to eat out of the cocoon, as it is termed, and to interbreed, still without reference to species; and as this has been going on from time immemorial, of course the species have become blended into a most confusing cross-breed. Hence it results that if a dozen cocoons are taken at random, no two moths will probably resemble each other.

This system of crossing is not confined to the Tusseh group. I have detected it more than once in what were termed Japan worms imported direct from that island; indeed, I have not only detected the cross, but I have succeeded in separating the species which composed it; in one instance, I found *Bombyx mori* crossed with

*B. Sinensis*, and on another occasion *B. Textor* and *B. Sinensis*. In the case of domesticated species there is no great difficulty to contend with, but with regard to the wild species the thing is very different, and, in short, I can scarcely yet say that I see my way at all clearly. In the Dehra Dhoon and extending up the hill side to about 4,500 feet, or perhaps more, we have two species of Tusseh, one of which is also found in Central India; what the other is, I am not yet prepared to say. Here, however, we have no artificial crossing, so that our species may be regarded as types. The difficulty is to get the sexes of two moths showing marks of relationship to come forth at the same time, so as to obtain a brood and compare the larvæ with others. To trust to the reports of the unscientific would only add to the confusion; a gentleman residing in one of these silk districts kindly furnished me with cocoons of what he declared to be distinct species, and furnished me with voluminous notes, but neither the one nor the other furnish the slightest data upon which I can work or depend; that a cross exists I can see, but my correspondent is not able to enter into my views and wishes. To visit the jungles myself at the season when the worms appear is out of the question, and the cocoons afford no information. Nevertheless, I shall continue to collect hints from all who may be kind enough to give them.

20. *Antheræa nebulosa.*—Hutton.—This is one of the species that has been crossed upon *A. Paphia*, and it seems to be not uncommon throughout Central India. It is a well marked species, and as specimens have been sent to England, we shall soon hear what the opinion is, provided the moths arrive in safety. The silk would probably rival that of *A. Paphia.*

21. *Antheræa* ———?—I refrain from naming this until I can obtain more specimens; it is found in Central India and in the Dehra Dhoon. It is quite distinct from either of the foregoing.

22. *Antheræa Pernyi.*—Guér. Mén.—This species was discovered in Mantchouria to the north of China, where it feeds on the oak. According to Mr. Atkinson, of the Educational Department, Calcutta, he has captured two specimens of what he declares to be this species, at Darjeeling; these flew to a light placed out in the evening, but nothing further was ascertained. The great difference between the climates of Darjeeling and Mantchouria calls especial attention to this discovery, and leads one to wonder that the species has not been detected at Mussoorie and Simla, both farther to the north. It would be as well if Mr. Atkinson would give his attention to the subject, and enable us to bring it under cultivation.

23. *Antheræa Yamamai.*—Guér. Méu.—This is a Japan species and is well thought of both in England and in France where great efforts have been made to introduce it, but as yet with very indifferent success. Last year I received through the kind offices of Dr. Wallace an ounce of these eggs direct from Japan, and found them to thrive admirably on our hill oak; unfortunately my means were not adequate to the undertaking, as gauze covers were found to be indispensable in order to ward off the attacks of insects, such as bugs, the larvæ of coccinallæ, spiders, &c., and as some of the young trees were about six feet in height, the expense was greater than I cared to undertake, as I was certain of no reward. However, the experiment was suddenly cut short in one night when the worms were in the fourth stage, by the incursion from below of a swarm of large black ants which carried off every one, so that like Lord Ullin, "I was left lamenting." The species however is well worth another trial if only for my own amusement.

21. *Antheræa Assama.*—This is the Mooga or Moongah worm of Assam which produces a very excellent silk, which, if well reeled by skilful hands, instead of being carded, would be extremely valuable. I have found this species in the Dehra Doon feeding upon a tree known to the natives as "*Kirkee,*" but I only procured one male and have not since seen another. I am searching for it, as there must be more than one.

22. *Antheræa Perrottetti.*—Guér. Mén.—Said to occur at Pondicherry, but although I long ago applied to the late Mr. Perrottet, he could not procure any specimen of it, although he sent *Antheræa paphia* (vera) and Actias Selene.

I am half inclined to regard it as a mere variety of *A. Paphia.*

23. *Antheræa Helferi*—Is found at Darjeeling, the cocoon resembling that of the common Tusseh; but no one seems inclined to do more in those regions than collect the moths.

24. *Antheræa Frithi*—Is another Darjeeling species, of which we know no more than of the last. At that station, where species are abundant, no one ever does more than collect the imago.

25. *Antheræa Royle*—Moore.—Is common at Simla, Mussoorie, Almorah, and, I think, Darjeeling. It feeds upon the common hill oak, spinning a large but thin cocoon between three or four leaves. I found it at Simla in the winter of 1836 by following a flock of tomtits, one of which, after a time, began tapping so loudly that I hastened to the spot and found the little fellow hard at work on the outer cocoon from which I drove him

off and pocketed the prize. The outer coating is very strong, and I do not think it could be reeled; but within this case is the true cocoon, of an oval form and yielding a good silk. The worms are easily reared, and sometimes give two or three crops, but this is when treated in the house.

The males will couple with *Antheræa Paphia*, but the produce never comes to anything.

26. *Antheræa* ———?—This is a species occurring near Bombay and discovered by the Messrs. Robertson, of the Civil Service, who regard it as allied to *A. Yamamai* of Japan. They have very kindly promised to send me cocoons as soon as procurable. From the rough sketch of the cocoon which Mr. E. P. Robertson sent me, it certainly appears to differ from *A. Paphia*, though I do not think it can possibly be *A. Yamamai*.

27. *Antheræa* ———?—Nothing is known of this species, except that I possess a well formed (probably male) cocoon of about the size of one of the *Bombyx mori*; the peculiarity exists in there being no vestige of a pedicle or safety rope, the cocoon being equally perfect at both ends. Unfortunately, during repeated illnesses, the label has been lost, and I have not the least recollection of where it came from or who sent it, although I incline to think it came from Madras through the kind offices of Mr. A. H. Blechynden. I am particularly anxious to obtain living specimens of this which is not only an undescribed species, but promises to be a valuable silk-yielder.

These remarks will serve to show how much scientific work yet remains to be done in this single genus of *Antheræa*.

28. *Attacus Atlas*.—Linn.—This the largest of the real silk spinners. Is common at 5,500 feet at Mussoorie and in the Dehra Doon; it is found also in some of the deep warm glens of the outer hills. It is also common at Almorah where the larva feeds almost exclusively upon the "*Kilmorah*" bush or *Berberis Asiatica*; while at Mussoorie it will not touch that plant but feeds exclusively upon the large milky leaves of *Falconeria insignis*. The worm is perhaps more easily reared than any other of the wild Bombycidæ, producing a very large and well-stuffed cocoon of a grey colour and somewhat difficult to unwind; a strong ley of potash appears to be the best solvent. The species is also abundant in Cachar, Sylhet, and is found also at Akyab, in Arracan, as well as in China.

29. *Attacus Edwardsi*.—This species was discovered at Darjeeling and is much darker in colour than the other, and rather smaller in size, but nothing seems to be known of its food and silk.

30. *Attacus Cynthia*.—Abundant at Mussoorie, feeding on various wild plants; common in China where it feeds on *Ailanthus glandulosa*; found in Assam, Cachar, Saugor. Although it is commonly reported to be under cultivation in different places (*vide* Colonel Agnew's Assam Report), yet such is not the case, the *Attacus ricini* being in India invariably mistaken for it. Indeed until a few years ago, when I pointed out the fact, *Attacus Cynthia* was not known to occur in India, the other species passing under that name, as the silk-worms did under that of *B. mori*. *Attacus Cynthia* has been imported into France and England and reared out in the open air on trees of *Ailanthus glandulosa*; it has likewise succeeded to some extent in Australia, and I believe they have it also at the Cape of Good Hope. There are difficulties attending the reeling of the silk as there is with all the *Attaci*, but nevertheless the French have succeeded in turning out some very good silk pieces. In England it is not quite so highly thought of as it once was. In Australia Mr. C. Brady has produced silk from it.

31. *Attacus Ricini*.—This is the worm that produces the silk known to the natives as the Arrindy silk; it is easily reared and feeds on the castor oil plant *Ricinus communis*. The silk is obtained by carding. The chief places of cultivation are Assam, Rungpore, and Dinagepore, in Eastern Bengal, *not at Dinapore*, as stated in one of Dr. Bennett's reports. It is also cultivated in smaller quantities in other places. The Mekirs to the eastward possess a very fine kind with white silk. *Attacus ricini* thrives well at Mussoorie, and has been introduced into France, Algeria, Malta, and other places.

32. *Attacus Guerini*—Moore.—Is known only from a few specimens of the moth in some museum in England, and I am induced to regard it as no more than an ill-fed specimen of *A. Ricini*. I have failed to procure it from any part of the country, though I have seen an approach to it in ill-fed specimens of the former in my own trays. This underfeeding, or semi-starvation is well exemplified in some very Lilliputian specimens of *Actias Selene*, received from a gentleman who reared it at Serampore, near Calcutta, where he only supplied the worms with food *twice a day*; the moths are only a quarter of the natural size.

33. *Actias Selene*—Very common in a wild state at Mussoorie, where it feeds on the wild cherry, wild pear, walnut, cedrela paniculata, coriaria nipalensis, and several other forest trees and shrubs. It occurs also at Almorah, Darjeeling, Assam, Cachar, Saugor, and at Serampore, near Calcutta. Mr. C. Turnbull failed to reel silk

from the cocoons sent down from this, but it has been reeled, though there is not much of it.

34. *Actias Mænas.*—Doubleday—Occurs at Darjeeling and is a very large species, but nothing has been recorded of its habits, food, or produce.

35. *Actias Leto*—Is another Darjeeling species, the economy of which has yet to be ascertained.

36. *Saturnia pyretorum*—Occurs at Darjeeling and Cachar, but nothing more is known of it.

37. *Saturnia Grotei.*—Has been found at Darjeeling, and one or two specimens have been captured at Mussoorie, but collectors of moths make no inquiries as to economy, and for all practical purposes the species might as well remain unknown. I am inclined to think that the larva feeds on the wild pear tree (*Pyrus Kytul?*)

38. *Saturnia Lindia*—Moore.—Of this nothing more is known than that it occurred in a collection made by the late Captain James Lind Sherwill, and is supposed to be from Darjeeling or its neighbourhood. It is allied to *Saturnia Grotei.*

39. *Saturnia Cidosa*—Moore.—From Captain J. L. Sherwill's collection also, and from North-Eastern India, but we have no information regarding it. From its being closely allied to *Saturnia pyretorum*, I should be inclined to suppose it an inhabitant of Darjeeling or Cachar.

40. *Neoris Huttoni*—Moore.—Found by myself at Mussoorie at about 6,500 feet of elevation, feeding on the wild pear tree. The larvæ are to be found in April. The cocoon is an open net-work, and would produce no silk.

41. *Caligula Simla*—Occurs at Simla, Mussoorie, and in Kumaon, feeding on the walnut, salix Babylonica, wild pear tree, &c., but the cocoon is a mere coarse open net-work through which the pupa is visible, and yields no silk.

42. *Caligula Thibeta*—Occurs at Mussoorie, where I have taken it on andromeda ovalifolia, wild pear, and common quince. It occurs also in Kumaon, but the specific name is a misnomer, the insect never approaching Thibet. Specimens were taken out of a collection made in Kumaon, and because the collector travelled into Thibet it was ridiculously enough called a Thibetan collection, and the species named accordingly. The cocoon is a coarse open net-work through which the larva is visible, but there is no available silk.

43. *Loepa Katinka.*—West.—A very beautiful yellow moth discovered originally in Assam, occurring also, according to my ideas, at Mussoorie. Mr. Moore, however, considers mine as distinct. I am not quite satisfied that the cocoon will not yield silk, but there is very little of it.

44. *Loepa Sivalica.*—Hutton.—Closely allied to the last, and found at Mussoorie at about 5,500 feet and lower. It will probably yield a small quantity of silk.

45. *Loepa Miranda.*—Atkinson.—Found by him at Darjeeling; a good and handsome species, but nothing more is recorded of it.

46. *Loepa Sikkimensis.*—Atkinson.—A very beautiful species found by Mr. Atkinson at Darjeeling. It may be known from the others, by the smaller size, and by the wings being clouded with maroon. Of its economy, nothing is known.

Three or four other species of this family occur in Darjeeling and Sylhet, but beyond their existence, nothing is recorded.

Those species which like *Actias selene* and *Antheræa paphia* weave strong compact cocoons perfectly closed at both ends, are furnished on each shoulder with a hard wing spur for the purpose of separating the fibres when the moth is ready to come forth; it may be heard grating against the silk and the point may often be seen protruding. It is common to the genera *Actias* and *Antheræa*, and was discovered by myself.

In *Attacus, Neoris,* and *Loepa,* the upper end of the cocoon is left open, the fibres pointing forward closely arranged, like the fine wires of a mouse-trap. No spine is needed in these *genera.*

In *Bombyx* and others, although the cocoons are entire, the silk is loosely woven, and the fibres being moistened by an acid from the mouth, are then easily separated by the claws on the fore-feet of the moths.

This is about the state and extent of our knowledge of the *Bombycidæ* of India; that there are many other species yet to be discovered, no naturalist will think of denying. Nature is the book through which the Almighty teaches man to look from earth to heaven, and as His works and knowledge are boundless, so has this beautifully illustrated book no end.

MUSSOORIE;
*The 26th July* 1871.

THOMAS HUTTON.

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~~From~~ 1871 No 4800 69

To The Secy to Govt of India in the Dept of Agriculture Revenue & Commerce

Dated 30 December.

Despatched 5th January 72

Received

Enclosures No.

General No. 4800 } 1871/72
No 39

Agri
Dec 4-71
Serial No. 9

Adverting to Resolution No 69 of 31st August last, submits that the office letter of 21st Augt 71 contained all the particulars available on the subject of sericulture in Burma, and that the efforts since made to collect further statistics have not had a favorable result.

No. 4800.

39.

Myore Chief Comm.r Office
Dated Camp Merecara 30th Dec.r/71

The Secretary to the Govt of India
in the Dept of Agriculture
Revr & Commerce.

Sir,

Adverting to the Resolution of Govt in the Dept of Agriculture Revr and Commerce No. 69 of the 31st August last, I have the honor by direction of the Chief Comr to submit for the information of the Govt of India that all the particulars available on the subject of Sericulture in Coorg under the several heads noted in your demi-official of the 22d June 1871 were embodied in Captain Clarke's letter No. 2497 of the 21st August last, and to state that the efforts since made to collect further statistics have resulted in bringing to light matters which had not already been reported to Govt.

With reference to the Experimental Silk Factory referred to in the

2 Experiments Cocoons are now being made, from which Reels are expected

copy sig.

From Asst Surgeon C. J. Smith
of 11th August 1849.

Resultless accident.

of para 5
the concluding part of Capt
Hankin's letter, dated Dunedin
to enclose copy of the marginally
noted report which gives an
interesting account of the operations
carried on therein from
1842 up to the time of its
abolition in 1849.

I have &c &c

Gen 28/12/71

W. Lee